TRU-TECH VALVE

SIMPLIFY YOUR WORLD.

ENGINEERING DATA

PNEUMATICALLY OPERATED DIAPHRAGM VALVES

P.O. Box 361 • 577 West Pike Street • Canonsburg, PA 15317
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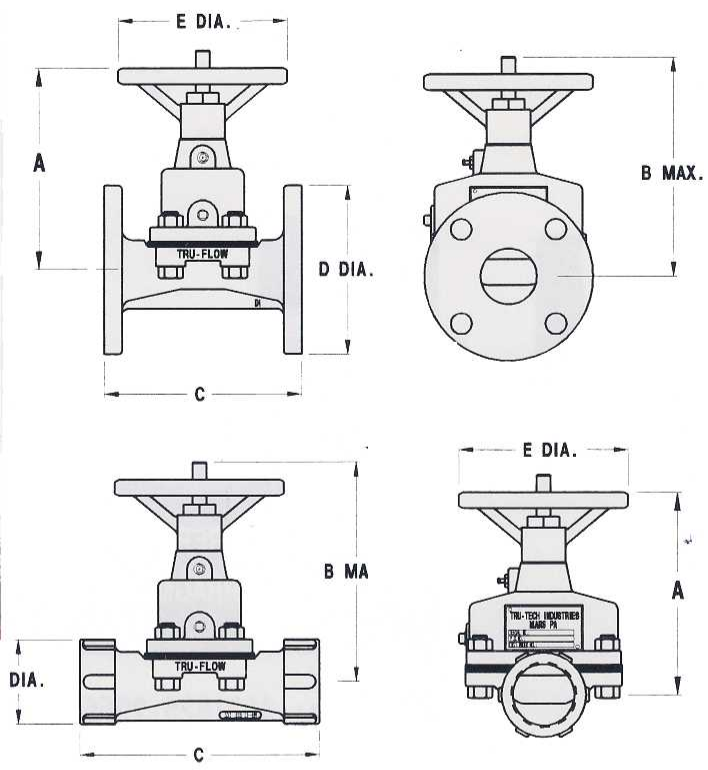
TTV T110 B
08/2012

ENGINEERING DATA
TRU-TECH DIAPHRAGM VALVES



Screwed Ends

SCREWED END - VALVE GENERAL DIMENSIONS							
Valve Size	A	B	C	Weight (lbs)	D	E	Body Pressure Rating (PSI)
1/2	4.00	4.69	7.25	5.00	1.88	3.50	200
3/4	4.00	4.69	7.25	5.00	1.88	3.50	200
1	4.00	4.69	7.25	5.00	1.88	3.50	200
1 1/2	5.50	6.13	8.50	13.00	3.25	5.00	175
2	5.50	6.13	8.50	13.00	3.25	5.00	175
2 1/2	8.38	10.50	10.50	35.00	4.50	9.00	150
3	8.38	10.50	10.50	35.00	4.50	9.00	150

Improved Straight Through Type

Flanged Ends

MAXI-FLOW AND TRU-FLOW VALVE GENERAL DIMENSIONS										
Valve Size	A	B	C MAXI-FLOW (MSS LENGTH)			C TRU-FLOW (ANSI LENGTH)	Weight (LBS)	D	E	Body Pressure Rating (PSI)
			Plastic Lined	Rubber Lined	Weight (LBS)					
1/2	4.00	4.69	5.75*	5.75*	11.00	5.00	10.00	3.50	3.50	200
3/4	4.00	4.69	5.75	5.75	11.00	5.00	10.00	3.50	3.50	200
1	4.00	4.69	5.75	5.75	11.00	5.00	10.00	3.50	3.50	200
1 1/4	4.00	4.69	5.75*	5.75*	11.00	5.00	10.00	3.50	3.50	200
1 1/2	7.25	9.00	7.88*	7.88*	27.00	7.00	25.00	6.00	5.00	175
2	7.25	9.50	7.88	7.88	27.00	7.00	25.00	6.00	7.00	175
2 1/2	8.38	10.50	10.25*	10.25*	35.00	8.00	45.00	7.00	9.00	150
3	8.38	10.38	10.25	10.25	52.00	8.00	45.00	7.50	9.00	150
4	11.25	14.00	12.88	12.75	80.00	9.00	70.00	9.00	12.00	150
6	17.88	22.00	16.38	16.25	160.00	10.50	125.00	11.13	14.13	125

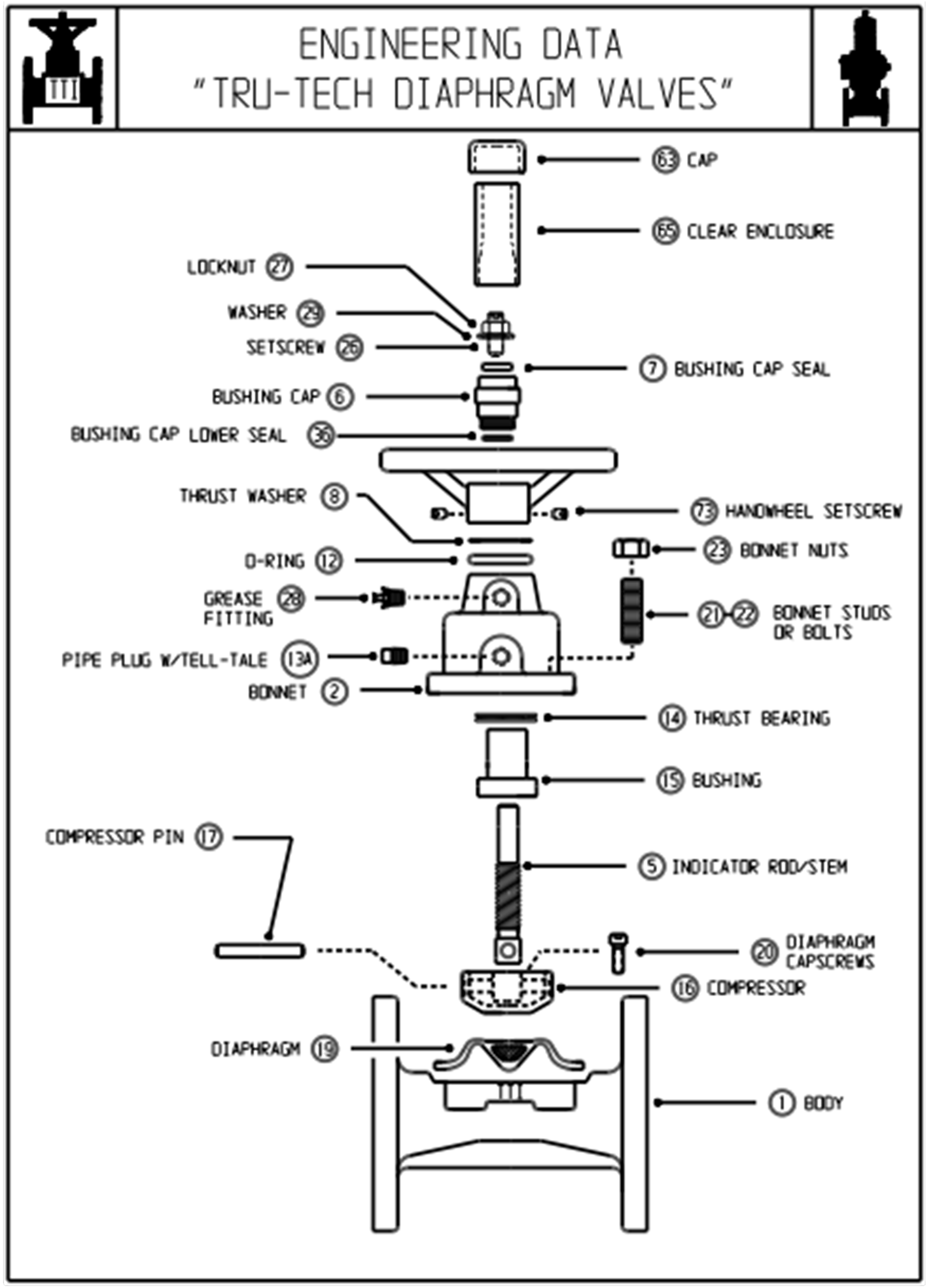
Enhanced Weir Type

Flanged Ends

MAXI-TROL AND TRU-TROL VALVE GENERAL DIMENSIONS										
Valve Size	A	B	C MAXI-TROL (MSS LENGTH)			C TRU-TROL (ANSI LENGTH)	Weight (LBS)	D	E	Body Pressure Rating (PSI)
			Plastic Lined	Rubber Lined	Weight (LBS)					
1/2	4.00	4.69	5.75*	5.75*	7.00	5.00	6.50	3.50	3.50	200
3/4	4.00	4.69	5.75	5.75	7.00	5.00	6.50	3.50	3.50	200
1	4.00	5.75	5.75	5.75	7.00	5.00	6.50	4.25	3.50	200
1 1/4	5.50	6.13	5.75*	5.75*	14.00	5.00	12.00	5.00	5.00	175
1 1/2	5.50	7.00	7.88*	7.88*	12.00	7.00	14.00	5.00	5.00	175
2	7.00	8.00	7.88	7.88	25.00	7.00	21.00	6.00	5.00	175
2 1/2	7.25	9.00	10.25*	10.25*	55.00	8.00	35.00	7.00	7.00	150
3	7.25	9.50	10.25	10.25	55.00	8.00	35.00	7.50	7.00	150
4	8.38	10.50	12.88	12.75	80.00	9.00	51.50	9.00	9.00	150
6	11.00	14.50	16.38	16.25	104.00	10.50	80.00	11.00	12.00	125
8	17.88	17.88	20.88	20.88	231.00	11.50	165.00	13.75	14.00	100
10	17.88	17.88	25.38	25.75	265.00	NA	NA	16.00	14.00	65

Manufacturers of TRU-TECH Diaphragm Valves

ENGINEERING DATA
TRU-TECH DIAPHRAGM VALVES



ENGINEERING DATA
TRU-TECH DIAPHRAGM VALVES

Parts List

NO.	DESCRIPTION	STANDARD MATERIAL
01	BODY	**
02	BONNET	CAST IRON, A126 CLASS B
03	HANDWHEEL	CAST IRON, A126 CLASS B
05	INDICATOR ROD/STEM	STEEL 12L14, BLACK OXIDE FINISH
08	THRUST WASHER	NYLON
12	BONNET SEAL *	BUNA-N
13A	PIPE PLUG W/TELL-TALE	POLYETHYLENE
14	THRUST BEARING	POLISHED STEEL
15	BUSHING	DUCTILE IRON, ASTM A536
16	COMPRESSOR	CAST IRON, A126 CLASS B
17	COMPRESSOR PIN *	CARBON STEEL, AISI 1070
19	DIAPHRAGM *	MATERIAL AS SPECIFIED
20	DIAPHRAGM CAPSCREWS	18-8 STAINLESS STEEL
21/22	BONNET STUDS OR BOLTS	STEEL GRADE 2, GRADE 5 ZINC PLATED
23	BONNET NUTS	STEEL GRADE 2, GRADE 5 ZINC PLATED
28	GREASE FITTING	STEEL, ELECTRO ZINC PLATED
26	TRAVEL STOP SETSCREW	STAINLESS STEEL, BLACK OXIDE FINISH
27	LOCKNUT	STAINLESS STEEL, ZINC-PLATED
29	WASHER	STAINLESS STEEL, ZINC-PLATED
63	ENCLOSURE CAP	POLYETHYLENE
65	CLEAR ENCLOSURE	ACRYLIC
73	HANDWHEEL SETSCREW	ALLOY STEEL, BLACK FINISH

* RECOMMENDED SPARE PARTS

** AS SUPPLIED, (DUCTILE IRON A536 GR 65-45-12, CAST IRON A126 CLASS B, 316 STAINLESS STEEL CF8M, ALLOY 20 CF7M, CAST STEEL WCB).

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ENGINEERING DATA
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Valve Sizing and Flow Calculation Guide

Valve size is usually determined by the system pipe size; however, with the low pressure drop of the Tru-Tech valves it may be advantageous to design the system with smaller pipe. It may also be desirable to calculate valve sizing in order to assure adequate and accurate throttling or flow control.

LIQUID FLOW: In order to simplify and standardize flow computations, valves are given a Cv rating (Fluid Controls Institute-Standard FC1 62-1) or flow coefficient. The Cv equals the flow through the valve (GPM water at 60°F) at a 1 PSI pressure drop. Flows at any other set of conditions can readily be determined from the following equations.

1. To determine Flow in GPM

$$Q = Cv\sqrt{\frac{P_1 - P_2}{G}}$$

2. To Determine Required Cv

$$Cv = \sqrt{\frac{Q}{\frac{P_1 - P_2}{G}}}$$

Q = Actual flow - gallons/min.
Cv = Valve flow coefficient
P_1 = Pressure (PSI) immediately upstream of the valve
P_2 = Pressure (PSI) imediately downstream of the valve
G = Specific Gravity of the liquid (water @ 60°F =1)

Another popular calculation procedure utilizes what is known as the valves resistance coefficient or "K" factor. The "K" factor is reasonably constant for any specific valve design.

3. To Determine Headloss

$$\triangle h = \frac{Kv^2}{2g}$$

$\triangle h$ = Headloss in feet of fluid
V = Fluid velocity (ft/sec)
g = Acceleration of gravity (32.2 ft/sec^2)
K = Approx. 0.5 Tru-Flow Valves, Approx. 2.5 Tru-Trol valves
NOTE: 1ft.water = .433 PSI

GAS FLOW: Gas Flow relationships may be calculated in a manner similar to fluids except that since gasses are compressible absolute pressure and temperature values must be used. (Also $P_1 - P_2$ cannot exceed 0.5 of P_1. Use 0.5 if number appears to be less.)

1. To Determine flow

$$Q = 963\ Cv\sqrt{\frac{(P_1 - P_2)(P_1 + P_2)}{GT}}$$

2. To Determine required Cv

$$Cv = 963\sqrt{\frac{Q}{\frac{(P_1 - P_2)(P_1 + P_2)}{GT}}}$$

Q = Flow = ft^3/HR (SCFH) @ 60°F and 14.7 PSIA
Cv = Valve Flow Coefficient
P_1 = Absolute Pressure (PSIA) immediately upstream of valve
P_2 = Absolute Pressure (PSIA) immediately downstream of valve.
G = Specific gravity of gas (Air = 1)
T = Absolute temperature of gas (460° + F)

VALVE SIZE (FLANGED ENDS)	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6	8
TRU-TROL VALVE Cv	11	17	23	34	55	75	130	190	310	515	560	1220
TRU-FLOW VALVE Cv	11	17	42	50	115	260	290	400	700	900	1650	-

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Square Root Table

NO.	SQUARE ROOT	NO.	SQUARE ROOT	NO.	SQUARE ROOT	NO.	SQUARE ROOT
1	1.0000	26	5.0990	51	7.1414	76	8.7178
2	1.4142	27	5.1962	52	7.2111	77	8.7750
3	1.7321	28	5.2915	53	7.2801	78	8.8318
4	2.0000	29	5.3852	54	7.3485	79	8.8882
5	2.2361	30	5.4772	55	7.4162	80	8.9443
6	2.4495	31	5.5678	56	7.4833	81	9.0000
7	2.6458	32	5.6569	57	7.5498	82	9.0554
8	2.8284	33	5.7446	58	7.6158	83	9.1104
9	3.0000	34	5.8310	59	7.6811	84	9.1652
10	3.1623	35	5.9161	60	7.7460	85	9.2195
11	3.3166	36	6.0000	61	7.8102	86	9.2736
12	3.4641	37	6.0828	62	7.8740	87	9.3274
13	3.6056	38	6.1644	63	7.9373	88	9.3808
14	3.7417	39	6.2450	64	8.0000	89	9.4340
15	3.8730	40	6.3246	65	8.0623	90	9.4868
16	4.0000	41	6.4031	66	8.1240	91	9.5394
17	4.1231	42	6.4807	67	8.1854	92	9.5917
18	4.2426	43	6.5574	68	8.2462	93	9.6437
19	4.3589	44	6.6332	69	8.3066	94	9.6954
20	4.4721	45	6.7082	70	8.3666	95	9.7468
21	4.5826	46	6.7823	71	8.4261	96	9.7980
22	4.6904	47	6.8557	72	8.4853	97	9.8489
23	4.7958	48	6.9282	73	8.5440	98	9.8995
24	4.8990	49	7.0000	74	8.6023	99	9.9499
25	5.0000	50	7.0711	75	8.6603	100	10.0000

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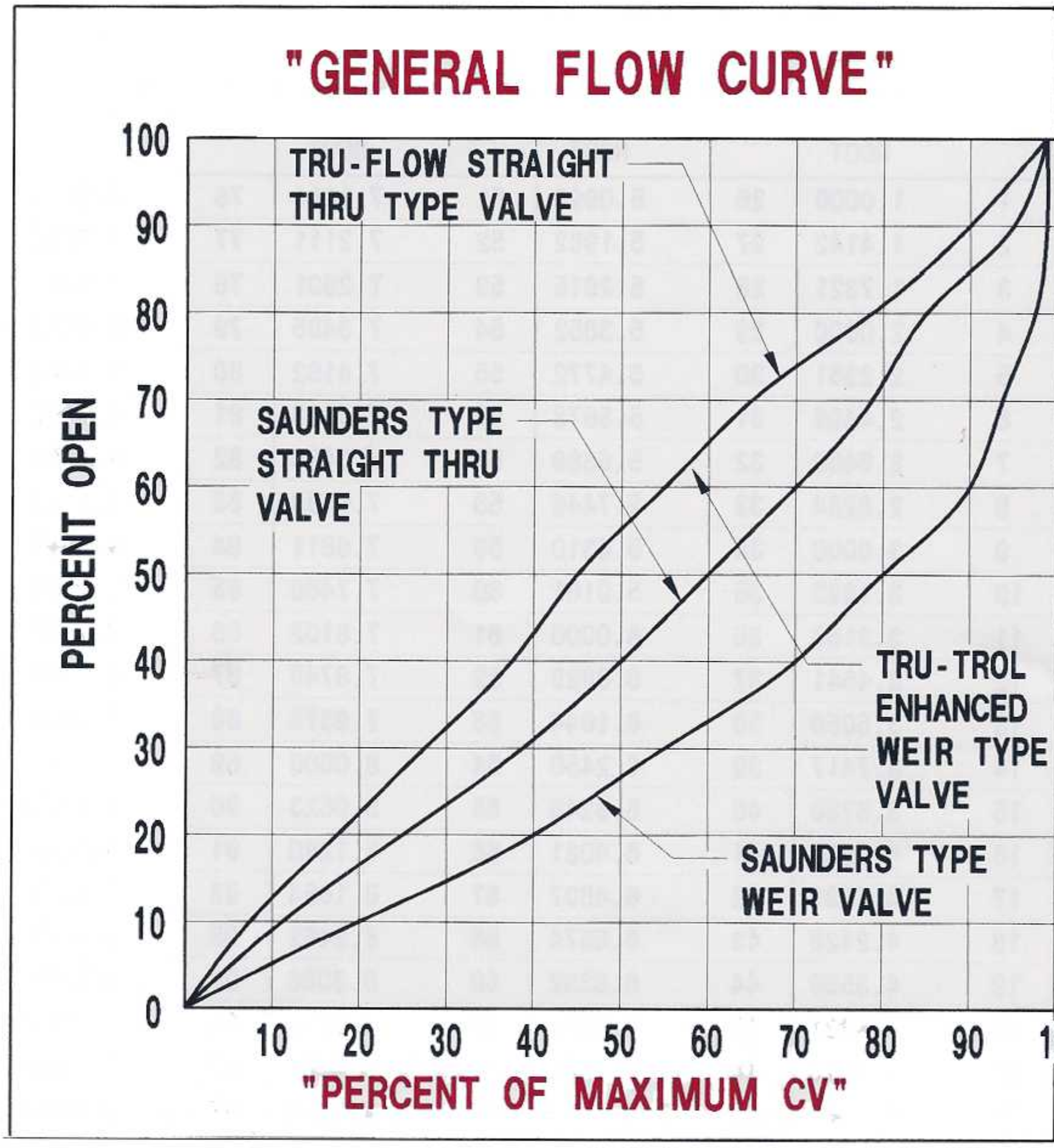

VALVE SIZE (FLANGED ENDS)	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6	8
TRU-TROL VALVE Cv	11	17	23	34	55	75	130	190	310	515	560	1220
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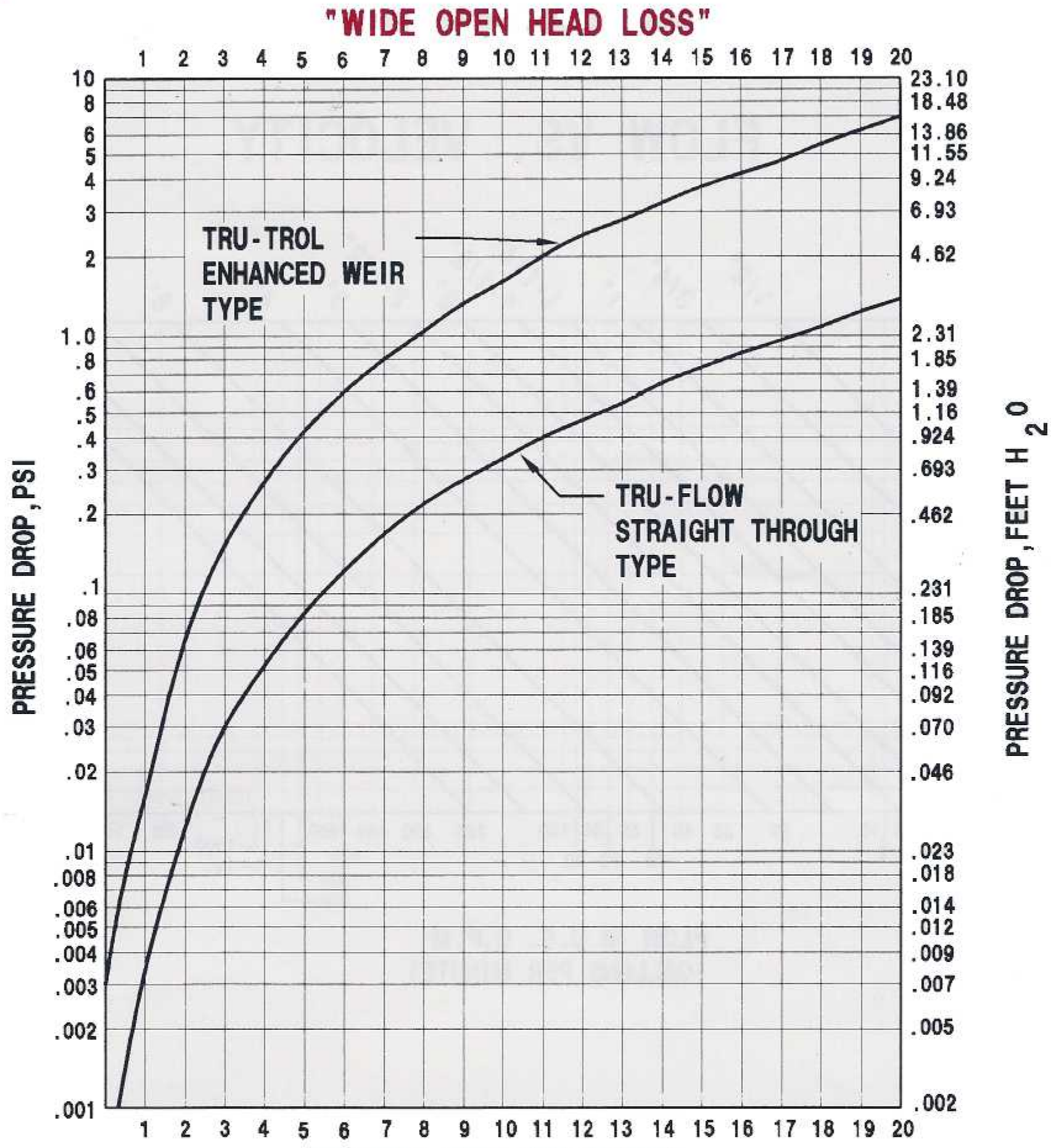

When selecting diaphragm valves, fluid velocity is a very important design consideration. Velocity through the valve should be limited to 15-20 ft/sec for clean fluids and 8-12 ft/sec for slurries. Velocity through a Tru-Tech diaphragm valve can be determined by using the following formula:

$$V = \frac{.32\ Q}{A}$$

A = PIPELINE AREA V = VELOCITY (FEET PER SECOND) Q = FLOW (GALLONS PER MINUTE)

PIPE SIZE (SCH.40)	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"	8"	10"	12"
PIPE AREA ($IN.^2$)	.304	.533	.864	1.50	2.04	3.36	4.79	7.39	12.7	20.0	28.9	50.0	78.9	113

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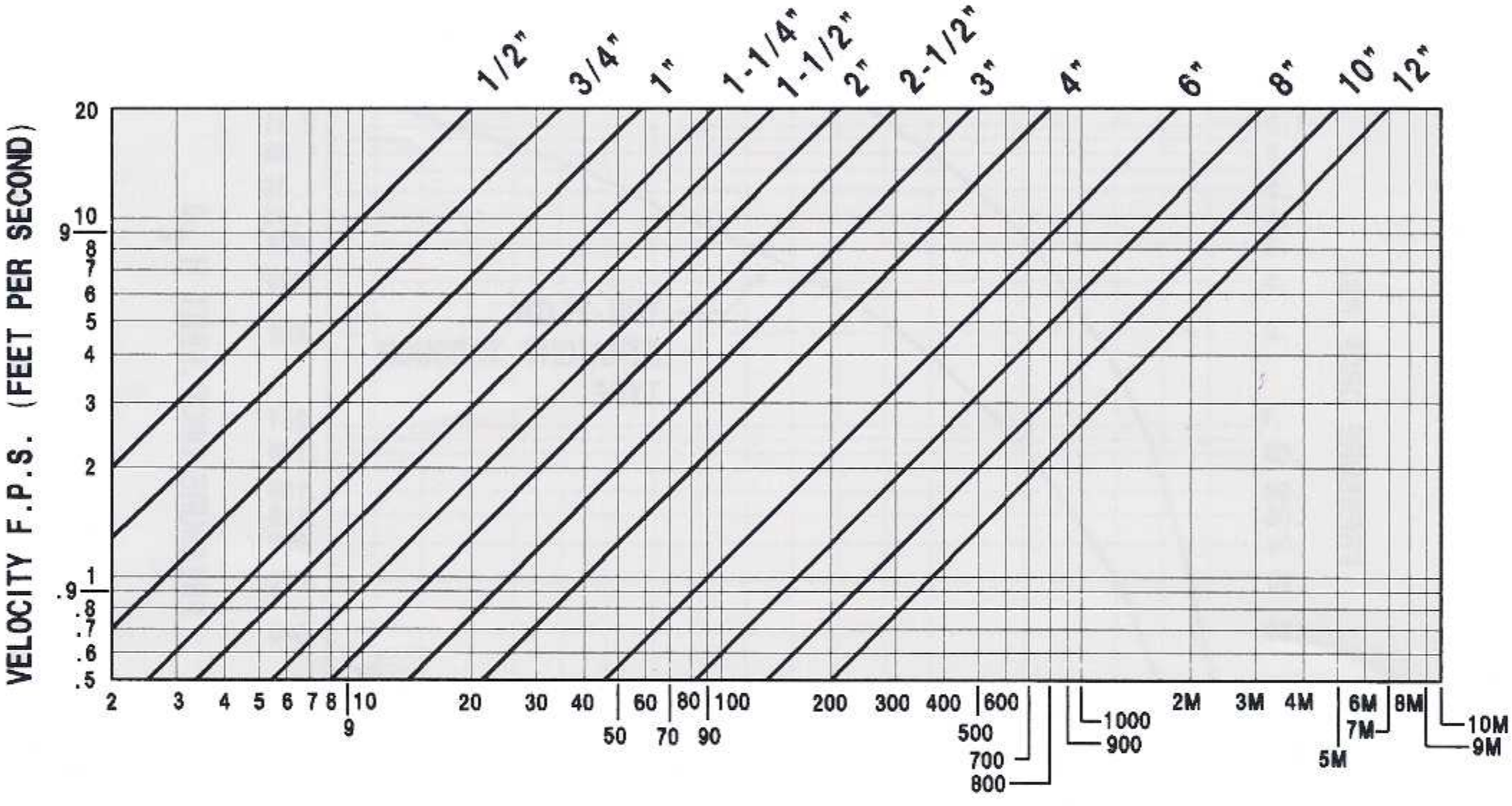
FLOW VS. VELOCITY



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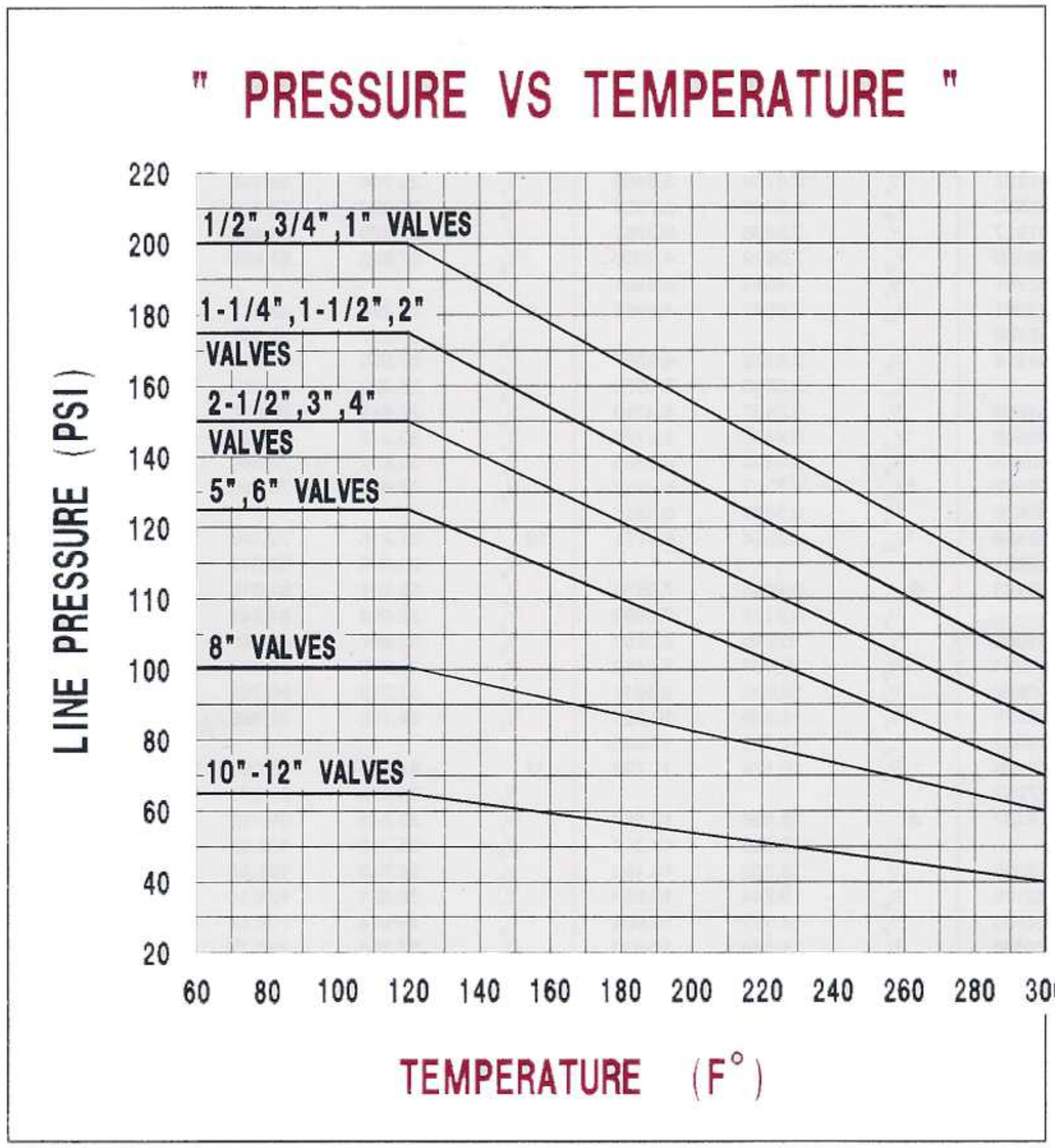

The effects of temperature/pressure on diaphragms and on linings in valve bodies should be considered in the selection process. The tensile properties of all materials decrease as the temperature increases. This reduction in strength can be compensated for by reducing the allowable operating pressure as fluid temperature increases.

The chemical activity of the fluid also increases as temperatures rise. This may be a consideration for choosing materials that are more corrosion-resistant.

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DIA.	CIRCUM.	AREA
1/64	.04909	.00019
1/32	.09818	.00077
3/64	.14726	.00173
1/16	.19635	.00307
5/64	.24544	.00479
3/32	.29452	.00690
7/64	.34361	.00940
1/8	.39270	.01227
9/64	.44179	.01553
5/32	.49087	.01917
11/64	.53996	.02320
3/16	.58905	.02761
13/64	.63814	.03241
7/32	.68722	.03758
15/64	.73631	.04314
1/4	.78540	.04909
17/64	.83449	.05542
9/32	.88357	.06213
19/64	.93266	.06922
5/16	.98175	.07670
21/64	1.0308	.08456
11/32	1.0799	.09281
23/64	1.1290	.10143
3/8	1.1781	.11045
25/64	1.2272	.11984
13/32	1.2763	.12962
27/64	1.3254	.13978
7/16	1.3744	.15033
29/64	1.4235	.16126
15/32	1.4726	.17257
31/64	1.5217	.18427
1/2	1.5708	.19635
17/32	1.6690	.22166
9/16	1.7671	.24850
19/32	1.8653	.27688
5/8	1.9635	.30680
21/32	2.0617	.33824
11/16	2.1598	.37122
23/32	2.2580	.40574
3/4	2.3562	.44179
25/32	2.4544	.47937
13/16	2.5525	.51849
27/32	2.6507	.55914
7/8	2.7489	.60132
29/32	2.8471	.64504
15/16	2.9452	.69029
31/32	3.0434	.73708
1	3.1416	.7854
1/16	3.3379	.8866
1/8	3.5343	.9940
3/16	3.7306	1.1075
1/4	3.9270	1.2272
5/16	4.1233	1.3530
3/8	4.3197	1.4849
7/16	4.5160	1.6230
1/2	4.7124	1.7671
9/16	4.9087	1.9175
1 5/8	5.1051	2.0739
11/16	5.3014	2.2365
3/4	5.4978	2.4053
13/16	5.6941	2.5802
7/8	5.8905	2.7612
15/16	6.0868	2.9483
2	6.2832	3.1416
1/16	6.4795	3.3410
1/8	6.6759	3.5466
3/16	6.8722	3.7583
1/4	7.0686	3.9761
5/16	7.2649	4.2000
3/8	7.4613	4.4301
7/16	7.6576	4.6664
1/2	7.8540	4.9087
9/16	8.0503	5.1572
5/8	8.2467	5.4119
11/16	8.4430	5.6727
3/4	8.6394	5.9396
13/16	8.8357	6.2126
7/8	9.0321	6.4918
15/16	9.2284	6.7771
3	9.4248	7.0686
1/8	9.8175	7.6699
1/4	10.210	8.2958
3/8	10.603	8.9462
1/2	10.996	9.6211
5/8	11.388	10.321
3/4	11.781	11.045
7/8	12.174	11.793
4	12.566	12.566
1/8	12.959	13.364
1/4	13.352	14.186
3/8	13.744	15.033
1/2	14.137	15.904
5/8	14.530	16.800
3/4	14.923	17.721
7/8	15.315	18.665
5	15.708	19.635
1/8	16.101	20.629
1/4	16.493	21.648
3/8	16.886	22.691
1/2	17.279	23.758
5/8	17.671	24.850
3/4	18.064	25.967
7/8	18.457	27.109
6	18.850	28.274
1/8	19.242	29.465
1/4	19.635	30.680
3/8	20.028	31.919
1/2	20.420	33.183
5/8	20.813	34.472
3/4	21.206	35.785
7/8	21.598	37.122
7	21.991	38.485
1/8	22.384	39.871
1/4	22.777	41.282
3/8	23.169	42.718
7 1/2	23.562	44.179
5/8	23.955	45.664
3/4	24.347	47.173
7/8	24.740	48.707
8	25.133	50.265
1/8	25.525	51.849
1/4	25.918	53.456
3/8	26.311	55.088
1/2	26.704	56.745
5/8	27.096	58.426
3/4	27.489	60.132
7/8	27.882	61.862
9	28.274	63.617
1/8	28.667	65.397
1/4	29.060	67.201
3/8	29.452	69.029
1/2	29.845	70.882
5/8	30.238	72.760
3/4	30.631	74.662
7/8	31.023	76.589
10	31.416	78.540
1/8	31.809	80.516
1/4	32.201	82.516
3/8	32.594	84.541
1/2	32.987	86.590
5/8	33.379	88.664
3/4	33.772	90.763
7/8	34.165	92.886
11	34.558	95.033
1/8	34.950	97.205
1/4	35.343	99.402
3/8	35.736	101.62
1/2	36.128	103.87
5/8	36.521	106.14
3/4	36.914	108.43
7/8	37.306	110.75
12	37.699	113.10
1/8	38.092	115.47
1/4	38.485	117.86
3/8	38.877	120.28
1/2	39.270	122.72
5/8	39.663	125.19
3/4	40.055	127.68
7/8	40.448	130.19
13	40.841	132.73
1/8	41.233	135.30
1/4	41.626	137.89
3/8	42.019	140.50
1/2	42.412	143.14
5/8	42.804	145.80
3/4	43.197	148.49
7/8	43.590	151.20
14	43.982	153.94
1/8	44.375	156.70
1/4	44.768	159.48
3/8	45.160	162.30
1/2	45.553	165.13
5/8	45.946	167.99
14 3/4	46.338	170.87
7/8	46.731	173.78
15	47.124	176.71
1/8	47.517	179.67
1/4	47.909	182.65
3/8	48.302	185.66
1/2	48.695	188.69
5/8	49.087	191.75
3/4	49.480	194.83
7/8	49.873	197.93
16	50.265	201.06
1/8	50.658	204.22
1/4	51.051	207.39
3/8	51.444	210.60
1/2	51.836	213.82
5/8	52.229	217.08
3/4	52.622	220.35
7/8	53.014	223.65
17	53.407	226.98
1/8	53.800	230.33
1/4	54.192	233.71
3/8	54.585	237.10
1/2	54.978	240.53
5/8	55.371	243.98
3/4	55.763	247.45
7/8	56.156	250.95
18	56.549	254.47
1/8	56.941	258.02
1/4	57.334	261.59
3/8	57.727	265.18
1/2	58.119	268.80
5/8	58.512	272.45
3/4	58.905	276.12
7/8	59.298	279.81
19	59.690	283.53
1/8	60.083	287.27
1/4	60.476	291.04
3/8	60.868	294.83
1/2	61.261	298.65
5/8	61.654	302.49
3/4	62.046	306.35
7/8	62.439	310.24
20	62.832	314.16
1/8	63.225	318.10
1/4	63.617	322.06
3/8	64.010	326.05
1/2	64.403	330.06
5/8	64.795	334.10
3/4	65.188	338.16
7/8	65.581	342.25
21	65.973	346.36
1/8	66.366	350.50
1/4	66.759	354.66
3/8	67.152	358.84
1/2	67.544	363.05
5/8	67.937	367.28
3/4	68.330	371.54
7/8	68.722	375.83

Manufacturers of TRU-TECH Diaphragm Valves

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ENGINEERING DATA
TRU-TECH DIAPHRAGM VALVES

DIA.	CIRCUM.	AREA
22	69.115	380.13
1/8	69.508	384.46
1/4	69.900	388.82
3/8	70.293	393.20
1/2	70.686	397.61
5/8	71.079	402.04
3/4	71.471	406.49
7/8	71.864	410.97
23	72.257	415.48
1/8	72.649	420.00
1/4	73.042	424.56
3/8	73.435	429.13
1/2	73.827	433.74
5/8	74.220	438.36
3/4	74.613	443.01
7/8	75.006	447.69
24	75.398	452.39
1/8	75.791	457.11
1/4	76.184	461.86
3/8	76.576	466.64
1/2	76.969	471.44
5/8	77.362	476.26
3/4	77.754	481.11
7/8	78.147	485.98
25	78.540	490.87
1/8	78.933	495.79
1/4	79.325	500.74
3/8	79.718	505.71
1/2	80.111	510.71
5/8	80.503	515.72
3/4	80.896	520.77
7/8	81.289	525.84
26	81.681	530.93
1/8	82.074	536.05
1/4	82.467	541.19
3/8	82.860	546.35
1/2	83.252	551.55
5/8	83.645	556.76
3/4	84.038	562.00
7/8	84.430	567.27
27	84.823	572.56
1/8	85.216	577.87
1/4	85.608	583.21
3/8	86.001	588.57
1/2	86.394	593.96
5/8	86.786	599.37
3/4	87.179	604.81
7/8	87.572	610.27
28	87.965	615.75
1/8	88.357	621.26
1/4	88.750	626.80
3/8	89.143	632.36
1/2	89.535	637.94
5/8	89.928	643.55
3/4	90.321	649.18
7/8	90.713	654.84
29	91.106	660.52
1/8	91.499	666.23
29 1/4	91.892	671.96
3/8	92.284	677.71
1/2	92.677	683.49
5/8	93.070	689.30
3/4	93.462	695.13
7/8	93.855	700.98
30	94.248	706.86
1/8	94.640	712.76
1/4	95.033	718.69
3/8	95.426	724.64
1/2	95.819	730.62
5/8	96.211	736.62
3/4	96.604	742.64
7/8	96.997	748.69
31	97.389	754.77
1/8	97.782	760.87
1/4	98.175	766.99
3/8	98.567	773.14
1/2	98.960	779.31
5/8	99.353	785.51
3/4	99.746	791.73
7/8	100.138	797.98
32	100.531	804.25
1/8	100.924	810.54
1/4	101.316	816.86
3/8	101.709	823.21
1/2	102.102	829.58
5/8	102.494	835.97
3/4	102.887	842.39
7/8	103.280	848.83
33	103.673	855.30
1/8	104.065	861.79
1/4	104.458	868.31
3/8	104.851	874.85
1/2	105.243	881.41
5/8	105.636	888.00
3/4	106.029	894.62
7/8	106.421	901.26
34	106.814	907.92
1/8	107.207	914.61
1/4	107.600	921.32
3/8	107.992	928.06
1/2	108.385	934.82
5/8	108.778	941.61
3/4	109.170	948.42
7/8	109.563	955.25
35	109.956	962.11
1/8	110.348	969.00
1/4	110.741	975.91
3/8	111.134	982.84
1/2	111.527	989.80
5/8	111.919	996.78
3/4	112.312	1003.8
7/8	112.705	1010.8
36	113.097	1017.9
1/8	113.490	1025.0
1/4	113.883	1032.1
3/8	114.275	1039.2
36 1/2	114.668	1046.3
5/8	115.061	1053.5
3/4	115.454	1060.7
7/8	115.846	1068.0
37	116.239	1075.2
1/8	116.632	1082.5
1/4	117.024	1089.8
3/8	117.417	1097.1
1/2	117.810	1104.5
5/8	118.202	1111.8
3/4	118.595	1119.2
7/8	118.988	1126.7
38	119.381	1134.1
1/8	119.773	1141.6
1/4	120.166	1149.1
3/8	120.559	1156.6
1/2	120.951	1164.2
5/8	121.344	1171.7
3/4	121.737	1179.3
7/8	122.129	1186.9
39	122.522	1194.6
1/8	122.915	1202.3
1/4	123.308	1210.0
3/8	123.700	1217.7
1/2	124.093	1225.4
5/8	124.486	1233.2
3/4	124.878	1241.0
7/8	125.271	1248.8
40	125.664	1256.6
1/8	126.056	1264.5
1/4	126.449	1272.4
3/8	126.842	1280.3
1/2	127.235	1288.2
5/8	127.627	1296.2
3/4	128.020	1304.2
7/8	128.413	1312.2
41	128.805	1320.3
1/8	129.198	1328.3
1/4	129.591	1336.4
3/8	129.983	1344.5
1/2	130.376	1352.7
5/8	130.769	1360.8
3/4	131.161	1369.0
7/8	131.554	1377.2
42	131.947	1385.4
1/8	132.340	1393.7
1/4	132.732	1402.0
3/8	133.125	1410.3
1/2	133.518	1418.6
5/8	133.910	1427.0
3/4	134.303	1435.4
7/8	134.696	1443.8
43	135.088	1452.2
1/8	135.481	1460.7
1/4	135.874	1469.1
3/8	136.267	1477.6
1/2	136.659	1486.2
5/8	137.052	1494.7
43 3/4	137.445	1503.3
7/8	137.837	1511.9
44	138.230	1520.5
1/8	138.623	1529.2
1/4	139.015	1537.9
3/8	139.408	1546.6
1/2	139.801	1555.3
5/8	140.194	1564.0
3/4	140.586	1572.8
7/8	140.979	1581.6
45	141.372	1590.4
1/8	141.764	1599.3
1/4	142.157	1608.2
3/8	142.550	1617.0
1/2	142.942	1626.0
5/8	143.335	1634.9
3/4	143.728	1643.9
7/8	144.121	1652.9
46	144.513	1661.9
1/8	144.906	1670.9
1/4	145.299	1680.0
3/8	145.691	1689.1
1/2	146.084	1698.2
5/8	146.477	1707.4
3/4	146.869	1716.5
7/8	147.262	1725.7
47	147.655	1734.9
1/8	148.048	1744.2
1/4	148.440	1753.5
3/8	148.833	1762.7
1/2	149.226	1772.1
5/8	149.618	1781.4
3/4	150.011	1790.8
7/8	150.404	1800.1
48	150.796	1809.6
1/8	151.189	1819.0
1/4	151.582	1828.5
3/8	151.975	1837.9
1/2	152.367	1847.5
5/8	152.760	1857.0
3/4	153.153	1866.5
7/8	153.545	1876.1
49	153.938	1885.7
1/8	154.331	1895.4
1/4	154.723	1905.0
3/8	155.116	1914.7
1/2	155.509	1924.4
5/8	155.902	1934.2
3/4	156.294	1943.9
7/8	156.687	1953.7
50	157.080	1963.5
1/8	157.472	1973.3
1/4	157.865	1983.2
3/8	158.258	1993.1
1/2	158.650	2003.0
5/8	159.043	2012.9
3/4	159.436	2022.8
7/8	159.829	2032.8

Manufacturers of TRU-TECH Diaphragm Valves

ENGINEERING DATA
TRU-TECH DIAPHRAGM VALVES

Sample Specifications for:
COMPACT STRAIGHT THROUGH TYPE DIAPHRAGM VALVES

This document provides an equipment specification for a manually operated, compact, "straight through" type diaphragm valve. This specification should be included in Division 15 (Mechanical) of the project manual. For additional information or technical assistance, refer to the individual product bulletin or contact the factory direct.

PART 1 - GENERAL

1.01 Submittals

A. Submit detailed product data and descriptive literature including dimensions, weights, CVs, pressure ratings and materials of construction.

B. Provide drawings which clearly illustrate the general arrangements of the equipment and cross-section views of the components.

PART 2 - PRODUCTS

2.01 Manufacturer

A. Tru-Flow, "Straight Through" Type, Diaphragm Valve, manufactured by Tru-Tech Industries, Inc., Mars, Pennsylvania.

2.02 Equipment

A. Construction: Diaphragm valve shall consist of a body, diaphragm and handwheel operator, assembled and tested as a unit and ready for field installation.

B. Main Valve:

1. Valve Body - shall be straightway style of cast ductile iron conforming to ASTM A536, GR 65-45-12, with integral flanges, faced and drilled per [ANSI B16.1 Class 125] [ANSI B16.5 Class 150]. The valve shall provide a substantially undiminished straight through flow path along the axis of the passage when the diaphragm is in the fully open position.

   It shall be of the "Compact" design, having a face to face dimension conforming to ASME/ANSI B16.10 Class 125 in iron and Class 150 in steel, table 1, columns 1, 8 and 21 (plus columns 2 and 11 except 1 and 40 NPS).

   Optional: Body shall be lined with _____ [Urethane, Neoprene, or Natural] rubber for superior protection against abrasion.

   Or: Body shall be lined with _____ [Tefzel (ETFE), PVDF, or Polypropylene (PP)] for superior protection against corrosion.

2. Diaphragm shall be compression molded around an oversized cast metal insert and shall be double studded to the compressor to positively prevent pull-out under severe operating conditions.

3. Diaphragm shall be of _____ [soft natural rubber, Neoprene, Ethylene Propylene, Viton, Teflon Faced EPDM, or other] material.

4. A thrust bearing of the mechanical type (needle or roller) shall be furnished on valves 2" and larger for ease of operation.

5. A grease fitting shall be furnished to lubricate the operating mechanism including the thrust bearing without disassembling the valve.

6. The valve shall be of the rising stem type and provide visual indication of whether the valve is open or closed.

7. The operating mechanism shall utilize stub acme threads designed to carry heavy thrust loads over many years of operation and under no circumstances shall either machined or rolled vee type threads be permitted.

8. Handwheel shall be securely keyed to the bushing or stem. Attachment by means of set screws or roll-pins shall not be permitted.

C. Shop Finishing: Valves shall be painted on the outside with manufacturer's standard primer, unless otherwise specified.

2.03 Function

A. The valve shall function to provide substantially unobstructed flow in the open position, throttle in the intermediate position and shut off bubble tight in the closed position.

PART 3 - EXECUTION

3.01 Installation

A. Install valve in accordance with manufacturer's written instructions and approved submittals.

3.02 Manufacturer's Field Service

A. Manufacturer's authorized representative shall be present at the jobsite for a minimum of [ ] man-days, travel time excluded, for assistance during equipment start-up and to train owner's personnel in the operation, maintenance and troubleshooting of the equipment provided.

ENGINEERING DATA
TRU-TECH DIAPHRAGM VALVES

Sample Specifications for:
ENHANCED WEIR TYPE DIAPHRAGM VALVES

This document provides an equipment specification for a manually operated, compact, "enhanced" Weir type diaphragm valve. This specification should be included in Division 15 (Mechanical) of the project manual. For additional information or technical assistance, refer to the individual product bulletin or contact the factory direct.

PART 1 - GENERAL

1.01 Submittals

A. Submit detailed product data and descriptive literature including dimensions, weights, CVs, pressure ratings and materials of construction.

B. Provide drawings which clearly illustrate the general arrangements of the equipment and cross-section views of the components.

PART 2 - PRODUCTS

2.01 Manufacturer

A. Tru-Trol, "Enhanced" Weir Type, Diaphragm Valve, manufactured by Tru-Tech Industries, Inc., Mars, Pennsylvania.

2.02 Equipment

A. Construction: Diaphragm valve shall consist of a body, diaphragm and handwheel operator, assembled and tested as a unit and ready for field installation.

B. Main Valve:

1. Valve Body - shall be straightway style of cast ductile iron conforming to ASTM A536, GR 65-45-12, with integral flanges, faced and drilled per [ANSI B16.1 Class 125] [ANSI B16.5 Class 150]. The valve shall provide a straight through flow path along the axis of the passage when the diaphragm is in the fully open position.

   It shall be of the "Compact" design, having a face to face dimension conforming to ASME/ANSI B16.10 Class 125 in iron and Class 150 in steel, table 1, columns 1, 8 and 21 (plus columns 2 and 11 except 1 and 40 NPS).

   Optional: Body shall be lined with _____ [Urethane, Neoprene, or Natural] rubber for superior protection against abrasion.

   Or: Body shall be lined with _____ [Tefzel (ETFE), PVDF, or Polypropylene (PP)] for superior protection against corrosion.

2. Diaphragm shall be compression molded around an oversized cast metal insert and shall be double studded to the compressor to positively prevent pull-out under severe operating conditions.

3. Diaphragm shall be of _____ [soft natural rubber, Neoprene, Ethylene Propylene, Viton, Teflon Faced EPDM, or other] material.

4. A thrust bearing of the mechanical type (needle or roller) shall be furnished on valves 2" and larger for ease of operation.

5. A grease fitting shall be furnished to lubricate the operating mechanism including the thrust bearing without disassembling the valve.

6. The valve shall be of the rising stem type and provide visual indication of whether the valve is open or closed.

7. The operating mechanism shall utilize stub acme threads designed to carry heavy thrust loads over many years of operation and under no circumstances shall either machined or rolled vee type threads be permitted.

8. Handwheel shall be securely keyed to the bushing or stem. Attachment by means of set screws or roll-pins shall not be permitted.

C. Shop Finishing: Valves shall be painted on the outside with manufacturer's standard primer, unless otherwise specified.

2.03 Function

A. The valve shall function to provide maximum flow in the open position, throttle in the intermediate position and shut off bubble tight in the closed position.

PART 3 - EXECUTION

3.01 Installation

A. Install valve in accordance with manufacturer's written instructions and approved submittals.

3.02 Manufacturer's Field Service

A. Manufacturer's authorized representative shall be present at the jobsite for a minimum of [ ] man-days, travel time excluded, for assistance during equipment start-up and to train owner's personnel in the operation, maintenance and troubleshooting of the equipment provided.

ENGINEERING DATA
TRU-TECH DIAPHRAGM VALVES

TABLE OF WATER HEADS AND EQUIVALENT PRESSURES
(To estimate any pressure multiply the head (in feet) by .433. The result is lbs. per square inch.)

Head (in feet)	Pressure (lbs. per sq in.)	Head (in feet)	Pressure (lbs. per sq. in.)	Head (in feet)	Pressure (lbs. per sq. in.)	Head (in feet)	Pressure (lbs. per sq. in.)
5	2.17	80	34.6	275	119	700	303
10	4.33	90	39.0	300	130	750	325
15	6.50	100	43.3	350	152	800	346
20	8.66	125	54.1	400	173	850	368
30	13.0	150	65.0	450	195	900	390
40	17.3	175	75.8	500	217	950	411
50	21.7	200	86.6	550	238	1000	433
60	26.0	225	97.4	600	260	1100	476
70	30.3	250	108	650	281	1200	520

METRIC CONVERSION TABLE

Millimeters x .03937 = inches.
Millimeters ÷ 25.4 = inches.
Centimeters x .3937 = inches.
Centimeters ÷ 2.54 = inches.
Meters x 39.37 = inches (Act of Congress).
Meters x 3.281 = feet.
Meters x 1.094 = yards.
Kilometers x .6214 = miles.
Kilometers ÷ 1.6093 = miles.
Kilometers x 3280.99 = feet.
Square Millimeters x .00155 = sq. inches.
Square Millimeters ÷ 645.2 = sq. inches.
Square Centimeters x .155 = sq. inches.
Square Centimeters ÷ 6.452 = sq. inches.
Square Meters x 10.765 = sq. feet.
Square Kilometers x 247.1 = acres.
Hectare x 2.471 = acres.
Cubic Centimeters ÷ 16.387 = cu. inches.
Cubic Centimeters ÷ 3.70 = fl. drams (U.S.P.)
Cubic Centimeters ÷ 29.57 = fl. oz. (U.S.P.).
Cubic Meters x 35.315 = cubic feet.
Cubic Meters x 1.308 = cubic yards.
Cubic Meters x 264.2 = gallons (231. cu. in.).
Liters x 61.022 = cu. in. (Act of Congress).
Liters x 33.84 = fluid ounces (U.S.P.).
Liters x .2642 = gallons (231 cu. in).
Liters ÷ 3.78 = gallons (231 cu. in.).
Liters ÷ 28.316 = cubic feet.
Hectoliters x 3.531 = cubic feet.
Hectoliters x .131 = cubic yards.
Hectoliters x 26.42 = gallons (231 cu. in.).
Grams x 15.432 = grains (Act of Congress).
Grams ÷ 981. = dynes.
Grams ÷ 28.35 = ounces avoirdupois.
Grams per cu. cent. 27.7 = lbs. per cu. in.
Joule x .7376 = foot pounds.
Kilograms x 2.205 = pounds.
Kilograms x 35.3 = oz. avoirdupois.
Kilograms ÷ 907 = tons (2,000 lbs.).
Kilograms per square cent. x 14.223 = lbs. per square inch.
Kilogram-meters x 7.234 = foot pounds.
Kilograms per meter x .672 = lbs. per foot
Kilog. per cu. meter x .062 = lbs. per cu. ft.
Kilowatts x 1.34 = Horse Power.
Watts ÷ 746. = Horse Power
Watts x .7378 = foot pounds per second.
(Centigrade x 1.8) + 32 = degrees Fahr.

ADDITIONAL FLUID POWER FORMULAE

1 Cu. ft. water weighs 62.4 lbs.

1 Bar at sea level:
= 14.504 PSI
= 0.98692 atmosphere
= 33.5 foot water column

Pascals x 6895 = PSI

PSI ÷ 1.45 x 10^{-4} = Pascals

Approx. $^1/_2$ PSI decrease each 1000 foot of elevation.

1"Hg = 0.4912 PSI
= 1.135 ft. water

1 PSI = 2.036"Hg
= 27.71"water
= 0.0689 bar

1 Atmosphere = 1.013 bars
= 29.921"Hg
= 14.696 PSI
= 760 mm Hg

Velocity of flow in pipe:
V = GPM x 0.3208 ÷ A
V is fluid velocity in feet per second; GPM is flow in gallons per minute; A is inside area of pipe in square inches.

Charles' Law for behavior of gases:
$T_1V_2 = T_2V_1$ or $T_1P_2 = T_2P_1$
T_1,P_1, and V_1 are inital temperature, pressure, and volume; and T_2,P_2, and V_2 are final conditions.

Boyle's Law for behavior of gases:
$P_1V_1 = P_2V_2$
P_1 and V_1 are initial pressure and volume; P_2 and V_2 are final conditions.

Hydraulic cylinder piston travel speed:
S = CIM ÷ A
CIM is oil flow into cylinder, cubic inches per minute; A is piston area in square inches.

Thrust or force of any cylinder.
T = A x PSI
T is thrust or force, in pounds; A is piston net area in square inches; PSI is gauge pressure.

Burst pressure of pipe or tubing:
P = 2t x S ÷ 0
P is burst pressure in PSI; t is wall thickness in inches; S is tensile strength of material in PSI; O is outside diameter, in inches.